

Spawning Season and Habitat of Olympic Outer Coast Surf Smelt (*Hypomesus pretiosus pretiosus*)

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Extended abstract

The Pacific coast of the Olympic peninsula is an exposed, wave swept environment hosting a diverse array of intertidal habitats, including gravel beaches that support significant populations of the surf smelt (*Hypomesus pretiosus pretiosus*). To date, little information is known about adult surf smelt biology, and most of our knowledge of Washington surf smelt life-history ecology comes from Puget Sound populations that are thought to be distinct from open coast populations.

Surveys of smelt spawning beaches (containing abundant 1 to 7 mm diameter gravels) within the Pacific Coastal Area of Olympic National Park (ONP) identified four beaches with evidence of surf smelt spawning, as determined by the presence of eggs (Wulschleger 1996, unpublished data). The northernmost beach, Rialto Beach hosts a substantial population of undetermined size that continues to support an historic recreational fishery. Rialto Beach has received particular scrutiny from ONP due to the potential effects of jetty construction and repair by the Army Corps of Engineers at its southern end, by the mouth of the Quillayute River. This jetty protects the harbor of the Quileute Indian Nation, and was breached by a storm in January 1996, leading to subsequent repairs.

The work presented here summarizes surf smelt spawning activity and habitat quality monitoring at Rialto beach from 1996 to 2000. Spawning activity was assessed through direct egg counts of collected beach gravels. Habitat quality was assessed through determination of suitable spawning gravel percentage. On approximately a monthly basis, gravel samples were collected from three zones on Rialto beach, spanning from Ellen Creek to the jetty on the Quillayute River. In each zone three random transects perpendicular to the shore were established. At low tides (< -1.0 ft), four 1-l gravel samples were taken at two elevations, just below the recent high water mark and at the mid-point between the high and low water mark. At each elevation, two samples were preserved in Stockard's solution and examined twice for surf smelt eggs under a dissecting microscope. The remaining two samples were dried and passed through a series of 10 Tyler-standard sieves using a Ro-TapTM sieve shaker to determine the gravel size fraction by weight. A total of 486 samples were examined for eggs and gravel size distribution.

Spawning activity varied markedly from year to year (Figure 1), with the highest spawning level occurring in 1997. Rialto beach surf smelt appear to spawn during the summer from May through September. This pattern is similar to that of the Whidbey-Camano Islands populations in Puget Sound (Penttila 1978), but is markedly different from the fall/winter spawning of other Puget Sound populations. Fall and winter are times of particularly harsh wave action on the open coast, which may interrupt spawning behavior, cause increased egg mortality, or move egg-bearing gravels to marginal subtidal habitats. Perhaps spawning season of the open coast population is a life-history adaptation to the more benign summer physical conditions. Smelt eggs were found abundantly both at the high and mid-tide points. Surf smelt spawn at high tide, thus observed spatial egg distributions are likely caused by wave-induced movement of gravels seaward as the tide recedes.

On average, 58.5% ($\pm 10.8\%$ SD) by weight of the gravels across Rialto beach were in the 1 to 7 mm diameter range from 1996 through 2000. No trend in gravel size was apparent across these years. This percentage of appropriate size gravels is markedly lower than the 80% by weight that Penttila (1978) found for Puget Sound spawning beaches in 1972 to 1973. It is unclear whether this difference reflects differences in physical regime (i.e. wave action, longshore currents) between the open coast and Puget Sound, or some long-term effect on gravel supply to Rialto beach by historic and current shoreline modifications. Data on gravel size distribution prior to the Quillayute jetty construction do not exist.

This study contributes to our understanding of the poorly understood open coast populations of surf smelt in Washington, and provides a useful comparison to the life-history biology of Puget Sound populations. This knowledge will help ONP resource managers to effectively manage surf smelt.

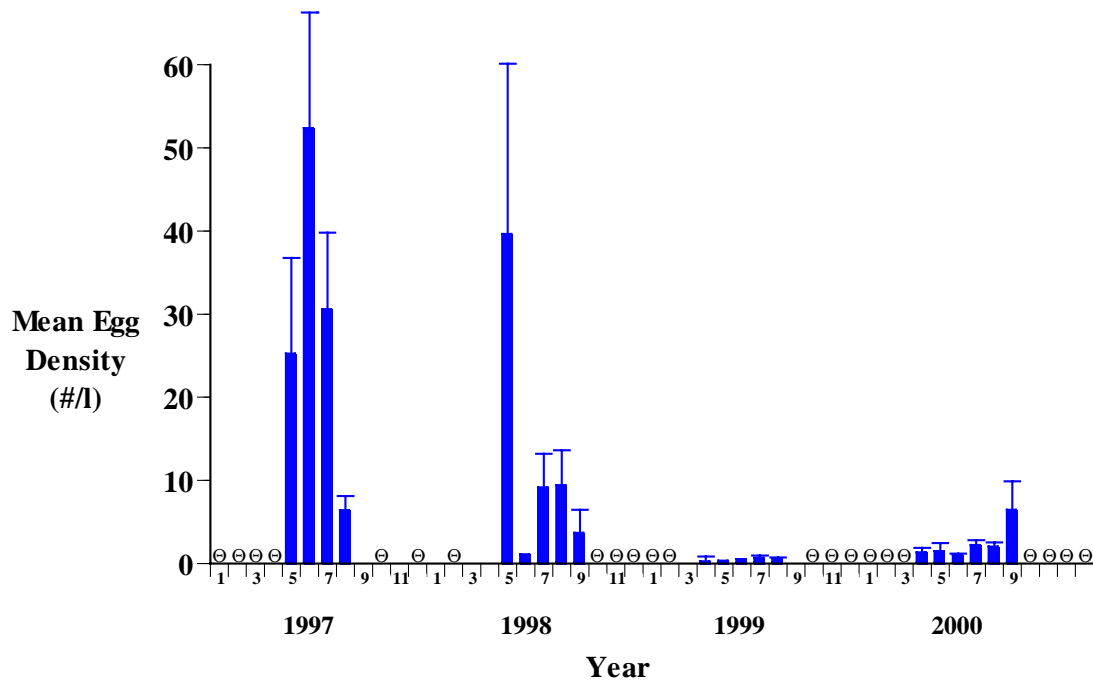


Figure 1. Mean density (#/l) of surf smelt eggs by month across the years 1997-2000 on Rialto Beach, Olympic National Park, WA. Theta (θ) denotes months where no samples were obtained.

References

- Fradkin, S.C. and J. Wulschleger. 2001. Olympic National Park, Quillayute Spit/Rialto Beach Surf Smelt Spawning Habitat Monitoring Final Report to the Army Corps of Engineers.
- Penttila, D. 1978. Studies of the surf smelt (*Hypomesus pretiosus*) in Puget Sound. State of Washington, Department of Fisheries. Technical Report Number 42. 47 pages.